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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/763,772	02/26/2001	Gustavo Deco	P00,1993	6347

21171 7590 06/09/2004

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EXAMINER	
BELL, MELTIN	
ART UNIT	**PAPER NUMBER**
2121	15

DATE MAILED: 06/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PR4

Office Action Summary	Application No.	Applicant(s)	
	09/763,772	DECO ET AL.	
	Examiner	Art Unit	
	Meltin Bell	2121	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 April 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 April 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☒ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *13/4-9-04*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

This action is responsive to application **09/763,772** filed 02/26/2001 (national stage entry of PCT/DE99/01949 International Filing Date: 07/01/1999) as well as the Drawing Corrections filed 4/9/04 and Amendment B filed 4/9/04. Claims 1-16 filed by the applicant have been entered and examined. An action on the merits of claims 1-16 appears below.

Priority

Acknowledgment is made of applicant's claim for foreign priority based on application number 198 38 654.0 filed in Germany on **8/25/98**.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the Office presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under

37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the Office to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1 and 6-16 are rejected under 35 U.S.C. 103(a) as being obvious over *Gevins* U.S. Patent Number 5,119,816 (June 2, 1992) in view of *Arroyo et al* "A Modular Software Real-Time Brain Wave Detection System" (April 1982).

Regarding claim 1:

Gevins teaches,

- forming discrimination values dependent on pulses that are formed by the pulsed neurons as well as on a training sequence of input quantities that are supplied to the neural network (column 4, lines 1-19, "The patient's head ... the desired classification"; column 13, lines 44-47, "Pulse widths of ... the two echos"; column 14, lines 24-55, "More accurate values...or other means")

- training the neural network for a first time span such that a discrimination value is maximized, as a result whereof a first discrimination value is formed (column 3, lines 35-54, "the position of ... or infirm patients"; column 4, lines 1-19, "The patient's head ... EEG recording session"; column 13, lines 44-47, "Pulse widths of ... the two echos")

- after the first discrimination value is formed:

- shortening the first time span to a second time span (column 13, lines 66-68, "The phase and...at the probe")

- forming a second discrimination value for the second time span (column 13, lines 44-47, "Pulse widths of...the two echos")

- forming a second discrimination value for the shortened second time span (column 13, lines 44-47, "Pulse widths of...the two echos")

- iteratively continuing to shorten the second time span and form a second discrimination value for each shortened second time span until the second discrimination value is different from the first discrimination value (column 5, lines 8-29, "For subsequent data...brain and head"; column 15, lines 3-17, "We have also...stop the loop")

- choosing as the trained neural network the neural network of the last iteration wherein the second discrimination value is the same as the first discrimination value (column 15, lines 3-17, "We have also...stop the loop")

However, *Gevins* doesn't explicitly teach shortening the second time span to a shortened second time span if the second discrimination value is the same as the first discrimination value while *Arroyo et al* teaches,

- shortening the second time span to a shortened second time span if the second discrimination value is the same as the first discrimination value (page 128, <u>Software Overview</u> section, paragraphs 4-6, "The feature extraction...xenon photo stimulator"; <u>The Implementation</u> section, paragraph 1, "The software system...this data base")

<u>Motivation</u> – The portions of the claimed method would have been a highly desirable feature in this art for

- Good classification error rates (*Arroyo et al,* page 126, Abstract, sentence 8, "The system has...classification error rates")
- Improving electroencephalograph (EEG) spatial resolution (*Gevins*, column 1, lines 57-68, "The three-dimensional positions...of a subject"; column 2, lines 1-24, "is measured. A...signals for distortion")

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to modify *Gevins* as taught by *Arroyo* for the purpose of improving classification accuracy.

Regarding claims 6-7, 9-16:

The rejection of claims 6-7 and 9-16 are the same as that for claim 1 as recited above since the stated limitations of the claim are set forth in the references.

Regarding claim 8:

The rejection of claim 8 is similar to that for claim 1 as recited above since the stated limitations of the claim are set forth in the references. Claim 8's limitations difference is taught in *Gevins*:

- supplying the sequence of input quantities to the neural network (column 4, lines 5-9, "scaling the vector...the desired classification")

- forming a classification signal that indicates what kind of sequence of input quantities the supplied sequence is (column 2, lines 15-24, "the EEG spatial...signals for distortion"; column 3, lines 62-68, "electrode positions are...that particular canonical"; column 4, lines 1-15, "head. The patient's...of that head")

Claims 2-3 are rejected under 35 U.S.C. 103(a) as being obvious over *Gevins* in view of *Arroyo et al* and further in view of *Peng et al* "Generalization and Comparison of Alopex Learning Algorithm and Random Optimization Method for Neural Networks" (May 1998).

Regarding claim 2:

Gevins teaches,

- forming discrimination values dependent on pulses that are formed by the pulsed neurons as well as on a training sequence of input quantities that are supplied to the neural network (column 4, lines 1-19, "The patient's head ... the desired classification"; column 13, lines 44-47, "Pulse widths of ... the two echos"; column 14, lines 24-55, "More accurate values...or other means")

- training the neural network for a first time span such that a discrimination value is maximized, as a result whereof a first discrimination value is formed (column 3, lines 35-54, "the position of ... or infirm patients"; column 4, lines 1-19, "The patient's head ... EEG recording session"; column 13, lines 44-47, "Pulse widths of ... the two echos")

- after the first discrimination value is formed:

- shortening the first time span to a second time span (column 13, lines 66-68, "The phase and...at the probe")

- forming a second discrimination value for the second time span (column 13, lines 44-47, "Pulse widths of...the two echos")

- forming a second discrimination value for the shortened second time span (column 13, lines 44-47, "Pulse widths of...the two echos")

- iteratively continuing to shorten the second time span and form a second discrimination value for each shortened second time span until the second discrimination value is different from the first discrimination value (column 5, lines 8-29, "For subsequent data...brain and head"; column 15, lines 3-17, "We have also...stop the loop")
- choosing as the trained neural network the neural network of the last iteration wherein the second discrimination value is the same as the first discrimination value (column 15, lines 3-17, "We have also...stop the loop")

However, *Gevins* doesn't explicitly teach shortening the second time span to a shortened second time span if the second discrimination value is the same as the first discrimination value or a first and second discrimination value optimization/maximization method that is not gradient based while *Arroyo et al* teaches,

- shortening the second time span to a shortened second time span if the second discrimination value is the same as the first discrimination value (page 128, Software Overview section, paragraphs 4-6, "The feature extraction...xenon photo stimulator"; The Implementation section, paragraph 1, "The software system...this data base")

Peng et al teaches,

- an optimization method that is not gradient based is utilized for the maximization of at least one of the first discrimination value and of the second discrimination value (page 1147, Abstract, sentences 3-4, "The Alopex algorithm...error norm measure")

Motivation – The portions of the claimed method would have been a highly desirable feature in this art for

- Faster convergence (*Peng et al*, page 1148, section V, paragraph 2, "Simulation results show...speed and range")
- Good classification error rates (*Arroyo et al,* page 126, Abstract, sentence 8, "The system has...classification error rates")
- Improving electroencephalograph (EEG) spatial resolution (*Gevins*, column 1, lines 57-68, "The three-dimensional positions...of a subject"; column 2, lines 1-24, "is measured. A...signals for distortion")

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to modify *Gevins* as taught by *Arroyo et al* and *Peng et al* for the purpose of improving classification accuracy and speed.

Regarding claim 3:

The rejection of claim 3 is the same as that for claim 2 as recited above since the stated limitations of the claim are set forth in the references.

Claims 4-5 are rejected under 35 U.S.C. 103(a) as being obvious over *Gevins* in view of *Arroyo et al* and further in view of *Deco et al* "Information Transmission and Temporal Code in Central Spiking Neurons" (December 8, 1997).

Regarding claims 4:

Gevins teaches,

- forming discrimination values dependent on pulses that are formed by the pulsed neurons as well as on a training sequence of input quantities that are supplied to the neural network (column 4, lines 1-19, "The patient's head ... the desired classification";

column 13, lines 44-47, "Pulse widths of ... the two echos"; column 14, lines 24-55, "More accurate values...or other means")

- training the neural network for a first time span such that a discrimination value is maximized, as a result whereof a first discrimination value is formed (column 3, lines 35-54, "the position of ... or infirm patients"; column 4, lines 1-19, "The patient's head ... EEG recording session"; column 13, lines 44-47, "Pulse widths of ... the two echos")
- after the first discrimination value is formed:
- shortening the first time span to a second time span (column 13, lines 66-68, "The phase and...at the probe")
- forming a second discrimination value for the second time span (column 13, lines 44-47, "Pulse widths of...the two echos")
- forming a second discrimination value for the shortened second time span (column 13, lines 44-47, "Pulse widths of...the two echos")
- iteratively continuing to shorten the second time span and form a second discrimination value for each shortened second time span until the second discrimination value is different from the first discrimination value (column 5, lines 8-29, "For subsequent data...brain and head"; column 15, lines 3-17, "We have also...stop the loop")
- choosing as the trained neural network the neural network of the last iteration wherein the second discrimination value is the same as the first discrimination value (column 15, lines 3-17, "We have also...stop the loop")

However, *Gevins* doesn't explicitly teach shortening the second time span to a shortened second time span if the second discrimination value is the same as the first discrimination value or the first discrimination value I(T) satisfies the following rule:

$$I(T) = I\left(s; \left\{ \begin{array}{c} t_1^{(1)},\ldots,t_m^{(1)},\ldots,t_{k1}^{(1)},t_1^{(2)},\ldots,t_m^{(2)},\ldots,t_{k2}^{(2)},\ldots, \\ t_1^{(n)},\ldots,t_m^{(n)},\ldots,t_{kn}^{(n)},\ldots,t_1^{(N)},\ldots,t_m^{(N)},\ldots,t_{kN}^{(N)} \end{array} \right\}\right),$$

wherein

- s references input quantities,
- $t_m^{(n)}$ references a pulse that is generated by a pulsed neuron n at a time m within a time span [0, T],
- k_n (n=1,…,N) references a point in time at which the pulsed neuron n has generated the last pulse within the time span [0,T], and
- N references a plurality of pulsed neurons contained in the neural network

while *Arroyo et al* teaches,

- shortening the second time span to a shortened second time span if the second discrimination value is the same as the first discrimination value (page 128, Software Overview section, paragraphs 4-6, "The feature extraction…xenon photo stimulator"; The Implementation section, paragraph 1, "The software system…this data base")

Deco et al teaches,

- the first discrimination value I(T) satisfies the following rule:

$$I(T) = I\left(s; \left\{ \begin{array}{c} t_1^{(1)},\ldots,t_m^{(1)},\ldots,t_{k1}^{(1)},t_1^{(2)},\ldots,t_m^{(2)},\ldots,t_{k2}^{(2)},\ldots, \\ t_1^{(n)},\ldots,t_m^{(n)},\ldots,t_{kn}^{(n)},\ldots,t_1^{(N)},\ldots,t_m^{(N)},\ldots,t_{kN}^{(N)} \end{array} \right\}\right),$$

wherein

- s references input quantities,
- $t_m^{(n)}$ references a pulse that is generated by a pulsed neuron n at a time m within a time span [0, T],
- k_n (n=1,...,N) references a point in time at which the pulsed neuron n has generated the last pulse within the time span [0,T], and
- N references a plurality of pulsed neurons contained in the neural network

(page 4697, paragraph 2, "We first consider...= $R \cdot I(\{t_0,\ldots,t_i,\ldots\};T)$. (2)").

- decision time as related to discriminability (page 4699, paragraph 2, "Let us analyze...is most efficient")

Motivation – The portions of the claimed method would have been a highly desirable feature in this art for

- Efficient discrimination (*Deco et al*, page 4700, paragraph 2, "In conclusion, the...transmission of information")
- Good classification error rates (*Arroyo et al,* page 126, Abstract, sentence 8, "The system has...classification error rates")
- Improving electroencephalograph (EEG) spatial resolution (*Gevins*, column 1, lines 57-68, "The three-dimensional positions...of a subject"; column 2, lines 1-24, "is measured. A...signals for distortion")

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to modify *Gevins* as taught by *Arroyo et al* and *Deco et al* for the purpose of improving classification accuracy and efficiency.

Regarding claim 5:

The rejection of claim 5 is similar to that for claim 4 as recited above since the stated limitations of the claim are set forth in the references. Claim 5's limitations difference is taught in *Deco et al*:

- the first discrimination value I(T) satisfies the following rule:

$$I(T) = -\int p(out) \cdot \ln(p(out))dt_1^{(1)} \ldots dtk_1^{(1)} \ldots dt_{kN}^{(N)} +$$
$$+ \sum_{j=1}^{s} p_j \int p(out|s^{(j)}) \cdot \ln(p(out|s^{(j)}))dt_1^{(1)} \ldots dtk_1^{(1)} \ldots dt_{kN}^{(N)}$$

with

$$p(out) = \sum_{j=1}^{s} p_j p(out|s^{(j)}),$$

wherein

- $s^{(j)}$ references an input quantity that is applied to the neural network at a time j,
- p_j references a probability that the input quantity $s^{(j)}$ is applied to the neural network at a pint in time j,
- $p(out|s^{(j)})$ references a conditioned probability that a pulse is generated by a pulsed neuron in the neural network under the condition that the input quantity $s^{(j)}$ is applied to the neural network at a point in time j

(page 4697, paragraph 3, "In the second...in the interval [*t'*, *t'* + *T*]"; page 4698, paragraph 1, "where *t'* is...same rate *R*")

RESPONSE TO APPLICANTS' AMENDMENT A REMARKS

Information Disclosure Statement

Applicant(s) argue(s) that the enclosed substitute form PTO-1449 has the month and year of publication of references noted in the prior office action in regards to the IDS of 2/26/01, the Examiner can understand the additional copy of the Gerstner reference and that only drawings were filed 6/11/01 vs. filing of an IDS (Amendment B REMARKS page 11, paragraphs 2-4).

The enclosed substitute form PTO-1449 has been entered and examined. It lists documents considered in the prior office action except for both copies of the Gerstner reference which the Examiner could not understand. The drawings filed 6/11/01 are noted.

Drawings

Applicant(s) argue(s) that the revised Fig. 2 addresses the questions noted by the Examiner in the prior office action (Amendment B REMARKS page 11, paragraph 6).

The amendments to Fig. 2 have been entered and examined. The objection to the Fig. 2 drawing in the prior office action is withdrawn. However, the 'WHKHS?' of FIG. 4's Item 402 is still not adequately explained.

Specification

Applicant(s) argue(s) that the amended drawings are more consistent with the specification amendments for addressing an objection raised by the Examiner in the prior office action (Amendment B pages 3-4).

The replacement paragraph amendments to the specification have been entered and examined. Incorporation of the new title has also been entered: Training a Neural Network of Pulse Neurons for Uses Such as EEG Signal Classification.

Claim Objections

Applicant(s) argue(s) that there is no conflict between the first discrimination value I(T) in claims 4-5 and that amendments have been made for claims 9 and 11-14 (Amendment B REMARKS page 11, paragraph 8).

The objection to claim 5 is withdrawn. The amendments to claims 9 and 11-14 have been entered and examined.

Claim Rejections - 35 USC § 101

Applicant(s) argue(s) that claims 1, 8, 11 and 14 refer to tangible neural networks producing a useful and concrete result (Amendment B REMARKS page 11, paragraph 9 and page 12, paragraphs 1-2).

The 35 USC § 101 rejections of claims 1, 8, 11 and 14 are withdrawn.

Claim Rejections - 35 USC § 112, first paragraph

Applicant(s) argue(s) that claims 1, 8, 11 and 14 are enabled by the specification (Amendment B REMARKS page 12, paragraph 3-5 and page 13, paragraphs 1-4).

The 35 USC § 112, first paragraph rejections of claims 1, 8, 11 and 14 are withdrawn.

Claim Rejections - 35 USC § 103

Applicant(s) argue(s) that 1) Gevins USPN 5,119,816 is completely silent on the neural network training part of the invention, 2) Gevins doesn't mention neural networks with pulsed neurons, 3) no invention features are disclosed in Arroyo et al "A Modular Software Real-Time Brain Wave Detection System" (April 1982), Peng et al "Generalization and Comparison of Alopex Learning Algorithm and Random Optimization Method for Neural Networks" (May 1998) and Deco et al "Information Transmission and Temporal Code in Central Spiking Neurons" (December 8, 1997) and 4) the subject matter of claims 1-16 are patentably distinguished over the references cited by the Examiner (Amendment B REMARKS page 13, paragraphs 5-6).

The examiner disagrees. Neural network training is mentioned in column 4, lines 7-9 of Gevins while pulsing is mentioned in column 13, lines 44-47 and neurons are mentioned in column 14, lines 26-49. Arroyo et al discloses shortening the second time span to a shortened second time span if the second discrimination value is the same as the first discrimination value on page 128, <u>Software Overview</u> section, paragraphs 4-6. Peng et al discloses the ALOPEX optimization method that is not gradient based which

is utilized for the maximization of at least one of the first discrimination value and of the second discrimination value on page 1147, Abstract, sentences 3-4. Deco et al discloses the first discrimination value I(T) satisfying specific rules on page 4697, paragraphs 2-3 and page 4698, paragraph 1.

Further, for the purpose of improving classification accuracy or speed, the motivation for combining the references include 1) Good classification error rates disclosed on page 126, Abstract, sentence 8 of Arroyo et al, 2) Improving electroencephalograph (EEG) spatial resolution disclosed in column 1, lines 57-68 and column 2, lines 1-24 of Gevins, 3) faster convergence disclosed on page 1148, section V, paragraph 2 of Peng et al and 4) efficient discrimination disclosed on page 4700, paragraph 2 of Deco et al.

As set forth above with regards to Arroyo et al, Gevins, Peng et al and Deco et al, the items listed explicitly and inherently teach each element of the applicants' claimed limitations. Applicants have not set forth any persuasive distinction or offered any persuasive dispute between the claims of the subject application, Gevins' EEG Spatial Placement and Enhancement Method, Deco et al's Information Transmission and Temporal Code in Central Spiking Neurons, Peng et al's Generalization and Comparison of Alopex Learning Algorithm and Random Optimization Method for Neural Networks and Arroyo et al's A Modular Software Real-Time Brain Wave Detection System.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the Office should be directed to Meltin Bell whose telephone number is 703-305-0362. This Examiner can normally be reached on Mon - Fri 7:30 am - 4:30 pm.

If attempts to reach this Examiner by telephone are unsuccessful, his supervisor, Anthony Knight, can be reached on 703-308-3179. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-3900.

Anthony Knight
Supervisory Patent Examiner
Group 3600

MB / am, k